New York State
Agricultural Experiment Station
CORNELL UNIVERSITY
GENEVA • NEW YORK

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Grape Prospecting by the Map

by Linda McCandless

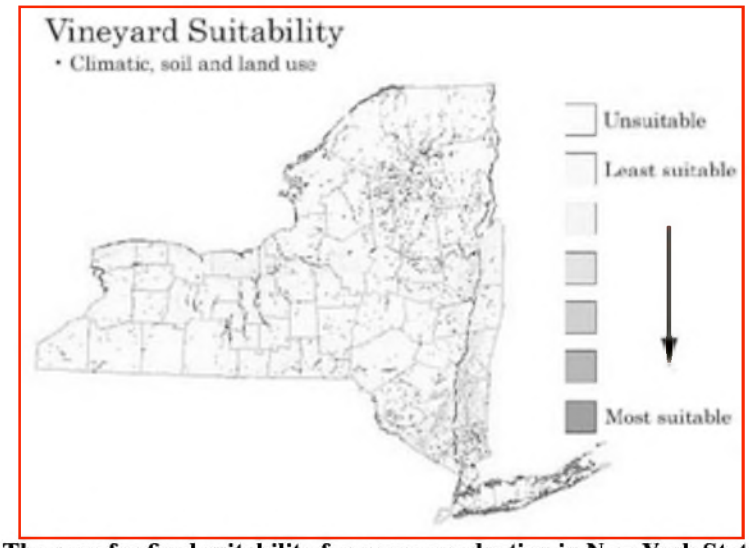
Grape specialist Tim Martinson inspects a weather station. In the vineyard site selection study, climate records and temperature measurements are used to assess vineyard site suitability.
CREDIT: R.Way/NYSAES/Cornell

GENEVA, NY: Winemakers in New York will always rely on yeast and sugar, but the Riesling, Pinot, and Chardonnay they bottle in the next century may have as much to do with satellites, digital weather sensors, and global positioning systems as they do with tradition.

"The French have spent centuries fine-tuning the art of vineyard site selection for vinifera grapes. New York grape growers have barely 100 years experience with the more profitable, highly sensitive varieties," said Robert Seem, a plant pathologist at the New York State Agricultural Experiment Station in Geneva, NY, who is seeking to improve the growers' odds. "Using Geographic Information System (GIS) technology, we have layered digital map and weather data collection systems and produced them over the Internet. Growers now have access to the data they need to situate vineyards optimally and expand production," he said.

The Cornell University professor is a leader in the application of site-specific weather information for the estimation of plant disease risk and has been involved in a three-year project to develop a database to provide better site maps for vineyard selection in New York.

The project is funded by a $47,000 grant from the Viticulture Consortium, a federally funded program that supports research activities in grape growing and wine making in New York and California. Cooperators and collaborators are Steve DeGloria, an international expert on the use of spatial data analysis for environmental applications in the department of Soil Crop and Atmospheric Sciences at Cornell in Ithaca; Roger Magarey, a graduate student in plant pathology at Geneva; Tony Wolf, an authority on viticultural production at the Virginia Polytechnic Institute; and Tim Martinson, area specialist with the Finger Lakes Grape Program who has established a temperature monitoring network throughout the Finger Lakes.



The map for final suitability for grape production in New York State is based upon climatic, soil and land use suitability.

"The vineyard site selection maps for New York are based on climate, soil, land use, and elevation," said Seem. The maps are accurate to 1 km^2 resolution, and can be viewed on the web at http://www.nysaes.cornell.edu/pp/faculty/seem/magarey. In two or three years, the team expects to have some climate maps refined to the hectare level. A hectare is 2.2 acres; New York vineyards average from 50 to 100 acres in size. General information about vineyard site selection has been compiled by Cornell University viticulturist Robert Pool and can be found at http://www.nysaes.cornell.edu/hort/faculty/pool/NYSite-Soils/SiteSelection.html. Wolf's vineyard selection site is located at http://www.ext.vt.edu/pubs/viticulture/463-016/463-016.html

Vinifera site selection has become more of an issue for grape growers and wine makers because table wine consumption is expanding in the premium and super-premium categories. Also, in the last 23 years, the

number of wineries in New York has increased from 10 to over 125. Winemakers have always used American grape varieties like Concord and Niagara, which are native to New York, to make popularly priced dessert and sparkling wines. The native varieties combine disease, insect, cold, and acid soil tolerance, but are no longer in as great demand as the pricier vinifera, which are harder to grow and more sensitive to environmental conditions.

"If a grower wants to situate a new planting of Riesling grapes in New York, for instance, he will have a much better chance if he uses our mapping system," said Seem. Bankers who provide the considerable investment required to expand also tend to be more comfortable with scientific maps than guesswork.

"From a standpoint of new vineyard investments, you can save yourself a lot of time and money if you have the ability to pinpoint high quality production sites," said Dave Peterson, winemaker and grower relations manager for Swedish Hill Vineyard.

Good site information is not only required for vinifera. According to Seem, "Every grower has superior and more restrictive areas on his farm. Growers need to understand how well their different fields rank in terms of climatic or soil limitations."

The advent of GIS technology has allowed researchers to handle site selection factors at a greater resolution and flexibility than ever before. GIS databases are spatial databases that enable the storage and rapid analysis of vast quantities of geographic information. Researchers expanded and capitalized on the present information, and combined the system with other computer programs that predict and interpolate weather data at the local level to provide growers with more and better information about vineyard siting than has been possible in the past.

In the current project, Magarey and Seem obtained digital maps of climate, soil and land use from ZedX Inc. (a commercial weather information company) that were derived from interpolating data from North American weather stations and adjusted for the influence of elevation. The maps with the greatest impact for New York grape growers are those showing extreme cold temperatures and the length of the frost-free season.

Severe injury to vinifera grapevines is likely to occur when temperatures are less than -5 to -10°F. Climatic maps show the entire state of New York experiences temperatures below these thresholds at least once every 10 years. Grape cultivation also requires 160

frost-free days, a variable that is strongly influenced by proximity to large bodies of water such as the Great Lakes, the Finger Lakes, and the Hudson River. Soils also need to be deep and well drained, with moderate to high pH. The most suitable soils in New York are those derived from limestone bedrock, which run in a crescent shape across the state.

"By digitally overlaying the climate and soil maps, we were able to show all areas that have both suitable climates and soil," said Magarey. In the final step, the maps were overlain with a land-use map to exclude urban areas and water bodies.

Growers can log onto the web site to access these maps or construct maps based on their own criteria. "The maps are of primary use to growers, consultants, and extension educators," said Seem.

Currently, the researchers are working on an air flow model map that will chart critical selection criteria such as frost pockets.

New York State is second in the nation in total grape acreage and wine production, and first in the production of grape juice. There are 990 vineyards in New York covering 31,400 acres of land. Of the 125 wineries, 106 have been established since the passage of the Farm Winery Act in 1976. Researchers at the Experiment Station have been critically involved in the expansion of the grape and wine industry in New York since the station's founding.

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